REMARKS

Claims 1, 9-11, 15,18-20, 22, 24, 36, 39, and 66 have been amended. Claims 1-13, 15-25, 36-39, 41-46, and 64-70 are pending. Applicant reserves the right to pursue the original claims and other claims in this and other applications. Applicant respectfully requests reconsideration of the above-referenced application in light of the amendments and following remarks.

The Title of the Invention has been amended to be more descriptive of the pending claims. No new matter has been added.

Minor editorial amendments have been made to claims 9-11, 15,18-20, 22, 24, 36, 39, and 66 for antecedent consistency. Entry of these amendments is respectfully requested.

Claims 1, 3-12, 15-18, and 20-23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Ding. The rejection is respectfully traversed.

The claimed invention relates to a method of forming a contact opening in a semiconductor device which utilizes a plasma etchant mixture containing at least one fluorocarbon. As such, claim 2 recites, *inter alia*, "etching said insulative layer with an etching composition consisting of ammonia and at least one fluorocarbon so as to form said contact opening." Ding does not disclose an etching composition consisting of ammonia and at least one fluorocarbon. Ding, in contrast, discloses using three different gases for etching dielectric layers 20 on substrate 25 (FIGS. 1a-1d).

For example, Ding teaches that the "etching process of the present invention uses a process gas . . . [t]he process gas includes (i) fluorohydro-carbon gas for forming fluorine-containing etchant species . . . (ii) NH_3-generating gas . . . (iii) carbon-oxygen gas . . . and (iv) optionally, an inert gas." (Col. 5, lines 45-56). In fact, the Title of Ding's

invention is: "Method for Etching Dielectric Using Fluorohydrocarbon Gas, NH_3-Generating Gas, and Carbon-Oxygen Gas." Since Ding does not disclose an etching composition "consisting of ammonia and at least one fluorocarbon," claim 1 is not anticipated.

Claims 3, 8-9, and 12 depend from claim 1. Claim 4 depends from claim 3. Claims 10 and 15 depend from claim 9. Claim 11 depends from claim 10. Claim 16 depends from claim 15. Claim 17 depends from claim 16. Claim 18 depends from claim 11. Claims 20 and 22 depend from claim 11. Claim 21 depends from claim 18. Claim 23 depends from claim 22. Accordingly, claims 3-12, 15-18, and 20-23 should be allowable along with claim 1 for at least the reasons provided above.

Claim 1-13, 15-25, 36-39, 41-46 and 64-70 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tan in view of Ding. The rejection is respectfully traversed.

As indicated above, claim 1 recites a method of forming a contact opening in an insulative layer comprising "etching said insulative layer with an etching composition consisting of ammonia and at least one fluorocarbon so as to form said contact opening." Tan and Ding do not teach or suggest etching with an etching composition consisting of ammonia and at least one fluorocarbon. Ding discloses a three etchant composition. The Office Action already acknowledges that Tan does not teach or suggest an etchant mixture of ammonia or fluorocarbons (pg. 4). Claims 2-13 and 15-25 are dependent on claim 1. For at least these reasons, claims 1-13 and 15-25 are not rendered obvious by the proposed combination of Tan and Ding.

Similarly, independent claims 36 and 64 are not rendered obvious by the proposed combination. First, Tan and Ding do not teach or suggest forming a protective layer on sidewall spacers that is from about 5 to about 50 Å thick. Second, Tan and Ding do not teach or suggest forming a structure with a conductive plug that is separated from sidewall spacers by a protective layer. Third, the Office Action has not met its burden in setting forth a *prima facie* case of obviousness. Fourth, there is no motivation to combine Tan and Ding. Fifth, even if the references are combinable, which they are not, Tan would undergo a major redesign and reconstruction to accommodate Ding's teachings, thereby completely destroying Tan's teaching. Finally, the proposed combination still would not teach or suggest Applicant's claimed methods.

Claim 36 recites a process for forming an opening in an insulative layer comprising, "forming a pair of adjacent gate stacks over said substrate; forming sidewall spacers on sidewalls of said adjacent gate stacks; forming an insulative layer over said substrate; forming a patterned photoresist mask layer over said insulative layer; and, etching an opening in said insulative layer . . . using a combination consisting essentially of ammonia and at least one fluorocarbon . . . wherein the step of etching an opening in said insulative layer forms a protective layer on said sidewall spacers that is from about 5 to about 50 Å thick." There is no disclosure or suggestion for a protective layer that is from about 5 to about 50 Å thick in the proposed combination of references.

Claim 64 recites a method of forming a conductive plug inside a self-aligned contact opening formed in an insulative layer by, "contacting said insulative layer with a plasma etchant mixture consisting essentially of ammonia and at least one fluorocarbon . . . wherein said contacting further forms a protective layer over opposed sidewall spacers . . . that is from about 5 to about 50 Å thick . . . and depositing a

conductive plug inside said etched opening such that said conductive plug is separated from said sidewall spacers by said protective layer." As indicated above, there is no disclosure or suggestion for a protective layer that is from about 5 to about 50 Å thick. Further, the references do not disclose or suggest a conductive plug separated from sidewall spacers by a protective layer.

The Office Action asserts that "[w]ith respect to the thickness of the protective layer, it is noted that the specification does not disclose anything critical regarding this particular thickness; therefore, this particular range is considered as routine optimization." (pg. 8). Applicant respectfully submits that the statement is in error. Applicant does not need to show criticality for the claimed thickness of the protective layer since the Office Action has not set forth a *prima facie* case of obviousness. This burden has not been met.

For example, "[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." M.P.E.P. § 2143.03 (emphasis added). The cited references simply do not teach or suggest a thickness for the claimed protective layer formed on sidewall spacers of a gate stack, which the Office Action acknowledges (pg. 8).

Further, "[i]n the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists." M.P.E.P. § 2144.05. Similarly, a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. M.P.E.P. § 2144.05. This is not the situation in the present case. Here, neither Tan nor Ding disclose or suggest a thickness, in combination or alone, the Applicant's claimed protective layer that is from about 5 to about 50 Å thick. Accordingly, since neither Tan nor Ding disclose or suggest a

thickness for the protective layer, no evidence of criticality is required.

Further, Tan and Ding are not properly combinable references. Tan relates to a process in which a self-aligned contact window is formed. To this end, Tan discloses substituting BPSG, used in the prior art, for an undoped silicon oxide layer serving as a dielectric layer (Col. 2, lines 47-49). The exposed undoped silicon oxide that is to be etched, is subsequently doped. This establishes a predetermined region 120 that is etched (FIG. 1D). Tan discloses merely uses a conventional etchant composition consisting of CHF_3, CF_4, and Ar (Col. 3, lines 45-47). Tan takes advantage of the etching selectivities of the various layers. For instance, Tan discloses that "the etching process for the self-aligned contact window 124 can be smoothly performed due to the etching selectivities of the dielectric layer 114a, the cap layer 106, and the spacer 108." (Col. 3, lines 52-55).

Ding, in contrast, relates to a process gas that provides high etch rates and highly selective etching of only 'dielectric layer' 120. As indicated above, Ding employs a three-etchant composition. The fluorohydro-carbon gas is used for "forming passivating deposits 46 on the substrate 25." (Col. 5, lines 49-51). The NH_3-generating gas is used for enhancing the etching rates by adsorping onto the surface of the substrate (Col. 5, lines 51-53).

One skilled in the art would not be motivated to combine Tan and Ding with such different methods. Although both references may arguably purport to etch a semiconductor device; this is where the similarity ends. Tan uses layers of the semiconductor device itself to control the different etch rates. Tan does not use a composition to control etch rates. Ding, in contrast, uses only the composition itself to control the etch rates. These are different processes directed to achieving different goals. A faster etch rate in Tan is not desired since the slower etching rate of the nitride

layer results in the plasma etch stopping at the sidewall spacers 108.

Moreover, even if the references are combinable, which they are not, it is not proper to combine references where doing so "would require a substantial reconstruction and redesign of the elements shown in the primary reference [i.e., Tan] as well as a change in the basic principle under which the primary reference [i.e., Tan] construction was designed to operate." In re Ratti, 270 F.2d 810, 813, 123 U.S.P.Q. 349, 352 (C.C.P.A. 1959). This is well-settled law and Office policy. See M.P.E.P. § 2143.01, page 2100-127 (Feb. 2003).

The 'modification' proposed by the Examiner, in the rejection of claims 1-13, 15-25, 36-39, 41-46 and 64-70, requires a substantial reconstruction and redesign of Tan's elements, and changes the basic principle under which Tan was designed to operate. For example, Tan relates to forming a self-aligned contact window. To this end, Tan uses the etching selectivities of dielectric layer 114a, cap layer 106, and sidewall spacers 108 to control how the self-aligned contact opening is formed. If Ding's teachings are combined with Tan, Tan's structure would have a polymeric coating 46 formed on sidewall spacers 108. Tan would not be able to form a self-aligned contact opening with the presence of a polymeric coating 46. The etching sensitivity of sidewall spacers 108 would not be available, defeating the very purpose of Tan's process. The only motivation to combine these references is gleamed from Applicant's disclosure. It is improper hindsight reconstruction.

Finally, even if the references are properly combinable, which they are not, the cited references still would not teach or suggest the subject matter of claims 36 or 64. The cited references would not disclose or suggest "the step of etching an opening in said insulative layer forms a protective layer on said sidewall spacers that is from about 5 to about 50 Å thick," as recited in claim 36, or a "plasma etchant mixture . . .

[which] forms a protective layer over opposed sidewall spacers . . . that is from about 5 to about 50 Å thick . . . [and] a conductive plug [which] is separated from said sidewall spacers by said protective layer," as recited in claim 64.

Claims 37-39 and 41-46 depend from claim 36. Claims 65-70 depend from claim 64. Claims 37-39, 41-46, and 65-70 are allowable along with their base claims for at least the reasons provided above.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

By_____

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